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TO THE

Graduating Class,

VIRGINIA MILITARY INSTITUTE,

JULY 2ND, 1869,

BY

✓
COM. M. F. MAURY, LL. D.,

Prof. of Physics, Va. Military Institute.

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PUBLISHED BY REQUEST.
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RICHMOND:
DISPATCH STEAM POWER PRESSES.
1869.

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VIRGINIA MILITARY INSTITUTE,
LEXINGTON, VIRGINIA.

ESTABLISHED AND SUPPORTED BY THE STATE OF VIRGINIA.

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COM. M. F. MAURY, LL. D.,
Professor of Physics and Superintendent of Physical Survey of Virginia.

ADDRESS

TO THE

GRADUATING CLASS,

VIRGINIA MILITARY INSTITUTE,

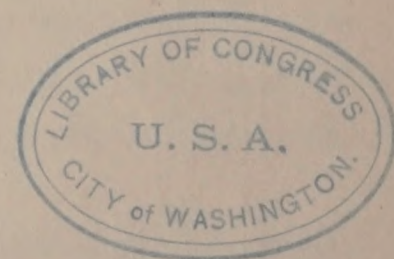
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ADDRESS.

“Ye’ll try the warld soon my lad,
And Andrew, dear, believe me,
Ye’ll find mankind an unco’ squad,
And muckle they may grieve ye.”

You have requested me, gentlemen of the graduating class, to give you a few parting words of advice. Considering the people to which you belong; the Christian principles and moral virtues which have been instilled into you at home; the precepts that have been taught you here; and the examples that have been set before you by your teachers and professors in the daily walks of life; I might content myself by simply reading the advice given by Burns to a young friend, from which I have snatched a couplet to attract your attention, with the hope that you will read it at leisure, and profit by it also.

But you desire something fresher than that, and I agree with you in this; for I think that the time, the occasion, and the circumstances by which we are surrounded, all call for something special.

You are about to turn over a new leaf in life’s history, and to commence, each one of you, upon a stage as wide as the world, to enact your part in the great drama. What that part shall be depends mainly upon your own choice. As to the brilliancy of the performance, that depends not a little upon the opportunity; but for its real merits it will depend chiefly upon the resolves which you may write upon that newly-turned leaf, and upon the fidelity with which you may carry them out. What these resolves should be are suggested by the cardinal virtues and dictated by the golden rule. It is needless for me to repeat them to you.

The course of training through which you have just passed is peculiar and eminently practical. It is admirably adapted to fit you for the duties of life, and, like men in real earnest, you want to know how best to turn it to account and reap to the full all the advantages of it.

First then, that you may have a proper conception of those advantages, and know exactly where you are, let me ask you, my young friends, what have you been doing here these three or four years?

I fancy the answer is instinctively upon the lips of some, to be sentimentally expressed in three words: "Finishing our education."

Pardon me, gentlemen, you have been no more *finishing* your education here than you have been fighting battles on dress parade. You have been laying the foundations for education, and so far, like those soldierly bearings, drills, and exercises, which have so much excited our admiration, and won our kindest sympathy for you, and which redound so much to your credit and the honor of your Alma Mater, your work has been done well. Your educational foundations have been laid broad and deep, and under the supervision and the guiding hand of skilful masters. They have cost you much labor, time and study, and unless you build upon them they will surely, in a few years, be like other foundations that have been neglected. They will be filled with the rubbish of time, and choked, as the garden of the sluggard, with the weeds of idleness; so that in a few years the materials—the very principles—and even the names of the text books and the fashion of the quarries from which you gathered them—will be lost to memory. This will surely happen unless you continue to work and to build upon what you have done here.

What, then, some may be ready to ask, "Are our studies never to end? We were disposed to do with our books as Macbeth would do with the physic."

Are the labors of the husbandman at an end when he puts his seed into the ground? or the builders when the corner-stone of the house is laid? And why should you expect, after planting or placing corner-stones, to be exempt from the labors of superstructure, or of culture and tillage? Because you have laid a corner-stone of polished marble, is your task done? Will the superstructure grow? On the contrary, it is just ready for the real work. The character of your studies as you engage in the battle of life will be changed; but you will be learners still; therefore, there must be no relaxation as to intensity of application; for whatever be the specialty you may fancy most, you can neither excel nor shine in your calling, or even win the respect of the good, unless you master it in all its details; for remember, that the mental activity of the world is such that all the arts, all the departments of human knowledge, all the avocations of human life, in which the forces of matter are brought to bear upon practical

affairs, all, all are progressive. Among the industrial pursuits of man there is not a single calling that has not, since the date of recorded history, received from the hand of progress the marks of improvement. The crow builds his nest, the beaver his dam, and the elk its yard, *now*, precisely as they did when Adam first called them by name. But, saving only the potter at his wheel, there is no human art or calling that is practiced now as it was in the days of old. The potter's wheel of the present day is the potter's wheel of Biblical times. The exception proves the rule. The potter's art has improved, though his simple wheel has not; and so it is with everything—all other implements and machinery employed in the affairs of men, from the nail to the ship, from the pot to the steam-boiler and engine, show improvement and indicate progress. These improvements and this progress are simply the result of an increase of man's knowledge as to the forces of nature and the properties of matter. That sort of knowledge is accumulating daily, for the discovery of every new fact in physics, the developments of every new principle in nature, the detection of every new property in matter, is a fresh clue placed in our hands. It leads into chambers of knowledge; it guides us through labyrinths into which our fathers could not find their way, and about the doors of which they groped in the dark; but it brings *us* out into the presence of everlasting truth. What a slender thread was that simple fact that was first observed in the kitchen: the touch of a knife imparted muscular action to dead muscles. Here was a new fact—a clue—more attenuated than the finest gossamer; but, being once observed, noticed, and placed in the hands of the student, and followed up, into what glorious chambers and splendid mansions of light and truth and everlasting knowledge has it not brought us? It has compelled the lightnings to wait on mortal man; to go and say to him, "Here we are—we, the fiery-footed messengers of heaven,—ready to plunge through the depths of ocean, to leap over mountains, to fly through air, and compass sea and land to do thy bidding." So it is with steam and its powers; with the polarization of light; the daguerreotype; the spectrum analysis; and all the great human inventions and improvements, both ancient and modern.

So far as we know, and with the single exception of the alphabet, all the great inventions, discoveries and improvements, that have marked the progress of the human family in its march upward and onward, have been first suggested by nature herself, and caught up seemingly by chance, and when developed, they have been found to

consist merely in the application of some physical force or other—in itself the most simple—to the practical affairs of life. The falling of an apple was a clue to the laws of gravitation. The absence of a single ray in the spectrum was, with its suggestions, a clue placed in the hands of philosophers for the first time the other day. It has led them into the very chambers of light, and revealed to us fresh cause for wonder, love, and praise towards the Author of all.

We now begin to suspect that gravity is not the only universal law; that there are other forces, as well as certain material substances, that are cosmical; that light and heat produce effects in the stars similar to the effects they produce here; that throughout the stellar spaces they are amenable to the same laws—so much so that a sound treatise on optics here would hold good in the stars also.

We suspect that there is continuity in the universe; that certain forms of matter that are familiar to us, and possessing the same properties by which they are made palpable to our senses, are present in the sun and stars. We know there are metals in the sun, gases in the stars. Solar iron and sidereal hydrogen, so far as we can apply tests to them, are the same there as they are here. Does it not ennoble your mind, enlarge your sympathies, and elevate the soul, to reflect that terrestrial substances, such as gases and metals, oxygen and hydrogen, silver and copper, iron and zinc, each one invested with the very properties by which we know it here, are present in the stars? that they are known to the inhabitants there for the same properties and by the same peculiarities by which we distinguish them? The thought—“like as when man did eat angels’ food”—brings us closer to things above, and makes us disposed to exclaim involuntarily, as we look aloft in the silent hours of the night and contemplate the stars in their glory, of a verity “our God is their God.”

Indeed, this little clue, the discovery and study of dark lines in the spectrum, has already led us into labyrinths where we hear science whispering, “Behold, and reflect how earth, sun, stars, and planets, are bound in kindred ties. Are they not—we and they—inhabitants and all, linked together all in glory and for one common destiny?”

When those around you are achieving such conquests, and signaling the age in which you live by such glorious triumphs of the human intellect, are you, gentlemen, after having laid such firm foundations for knowledge as you have been doing here, going to fling away study, shut your books and your eyes to the wonders of creation, and live in ignorance of all fresh knowledge that your contem-

poraries in other parts of the world are gathering and recording for future generations?

The clue which Kerchoff has placed in our hands is bringing us, not only to know what the lights of heaven are made of, and to acquaint us with its "husbandry," but it is promising to tell us whether this or that celestial object may have physical conditions analogous to what we have here.

Having laid your educational foundations under such happy auspices, and being about to enter upon the great battle of life, after such training, it is your duty to assist, each in his way, in winning those conquests of mind over matter which constitute the progress of the age, and make the improvements of the day the glory of your own generation. What is it but the increase and diffusion of knowledge that has given us our arts, our sciences, our manufactures, our comforts, our luxuries, our civilization—in short, everything that raises us above the savage, who, by his ignorance, is degraded to the level of the brutes with which he herds. And from what did this increase of knowledge arise but from observing the operations and studying the laws of nature?

The pursuit of knowledge and especially of this kind of knowledge, is the noblest of all occupations that engage the energies of man; it ennobles his mind and dignifies his nature.

Cast your eye over the world, and you will see that the men who observe and think are few. Why? Because we are all prone to indolence. One of the thinkers of the day tells us that "An immense majority of men always remain in a middle state, neither very foolish nor very able; neither very virtuous nor very vicious; but slumbering on in a peaceful and decent mediocrity, adopting, without much difficulty, the current opinions of the day, making no inquiry, exciting no scandal, causing no wonder; but just holding themselves on a level with their generation, and noiselessly conforming to the standard of morals and of knowledge common to the age and country in which they live."* A vast majority! He means not ten, but tens of thousands to one.

I take it for granted that every young man that is trained up as you have been, goes out into the world with aspirations for something higher than merely to drift down the tide of time with such as these.

*Buckle.

“Are we, then,” you may ask, “to devote our lives *mainly* to physical research, and to the observation and study of nature? her laws?” By no means. Every one of you will probably adopt some calling or other. It may be in the arts, it may be in literature, it may be in the humanities, or it may be in some branch of the applied sciences. But, be the specialty what it may, your first aim is to master the calling, striving so to acquit yourself in it as to win the confidence and esteem of all with whom it may bring you in contact. But no one calling satisfies the cravings of the truly noble mind. You are members of society; you owe duties to it, and will possess influence upon it—some more—some less. But every one will have, nay, you already have, influence with some members of it—powerful for good or for evil. Let it be a rule always to use that influence for good.

But there is time for all this, and to spare. To keep the mind vigorous, healthful, and strong, the different faculties—the different apartments of the brain—like the different muscles of the body, require frequently to be brought into play and exercised, that they may be strengthened. Therefore give now and then a moment of relaxation from the stern duties of life, to observation and contemplation of such features of God’s handiwork as may be most congenial to your tastes, aspirations and fancies. If you have a fancy for literature, poetry, or the fine arts, cultivate it. It is a gift, and, therefore, not, without irreverence, to be despised or neglected. Take care, gentlemen; these gifts and advantages of yours are as money lent you, to be put out on usury. They are precious talents, and are not to be buried in a napkin.

Strive, also, to cultivate at least some one of the departments of physical science—not as a smatterer, nor, necessarily, as an expert, but master it sufficiently to understand its principles and to find companionship among its phenomena.

I know of no mental habit more worthy of zealous cultivation than the habit of close and attentive observation. Man, you know, more than any other creature, has the faculty of observing and remembering, of collecting and comparing, and of drawing conclusions by the lights of reason. Now, remember, that it is chiefly by bringing these powers and attributes to bear upon the facts and phenomena of nature that the world has been brought from the rude condition of ancient days to its present advanced state of industrial energy and material prosperity. Remember, that to observe nature does not require those rare powers that the young, especially, are apt to fancy. All of us,

each in his way, are observers of nature; and it is the faculty of noticing what comes under the eye, and of striving, each in his own way, to trace effect back to cause, that I am advising you to cultivate and nourish until it ripens into habit.

You remember it was the fact, familiar to others, no doubt, but first noticed by a pump-maker, that led to the invention of the barometer, an instrument which now daily and hourly saves ships and their crews, merchants and their fortunes, from wreck and disaster.

The whole science of electricity has grown out of a fact first noticed in the kitchen.

A traveler bought a writing desk in England, brought it to this country, and observed that it soon began to warp, crack, and split. That fact led to the discovery of a most important meteorological circumstance, viz:—that the climate of America is dryer than the climate of England.

And so with many other discoveries—as the aberration of light—by noticing that the wind-vane on board a vessel under sail pointed differently the moment she anchored.

Every physical fact, by whomsoever observed, is, when placed in its true connections, a discovery, an invention; and all such facts are like the sheaf of magic wheat—the more it is threshed the more it yields.

Here let me remind you that I do not wish you to infer too much. In citing these examples, and urging you on to observation and study, I do not wish you to understand that I am holding them up to you as the *chief* incentive why you should observe and study the phenomena of nature. Far from it. The chief incentive which I wish to hold out to you for the study is, the idea that it will certainly make you wiser and better men, and may make you benefactors, if not of the world, at least of your own people. What you are to observe is the work of God—a writing traced by holy fingers, and spread out before you by omnipotent hands, with gems and precious stones, for your good, your enjoyment and your delight. The pleasures and the profit which the fondest student of history, or the most devoted admirer of romance, of song, or of story, or the greatest lover of music derives from reveling in his specialty, is not to be envied for a moment by the observing student of nature as he pores over this great and mighty tome, which the Creator has garnished with the stars above, spread out in the air, suspended in the trees, written upon the landscape, engraved upon the rock, and buried in the earth.

As an example, you have learned here the properties of light, and placed the knowledge in your educational corner-stone. Light, heat, and sound, you remember, are all impressed upon our senses in the same way. Color is conveyed to the eye by the vibrations, just as music is to the ear. But the organs of the human ear are so ordered that it cannot comprehend color any more than the eye can see sound. Nevertheless, your right-minded observer of nature may, whenever, with his mental eye, he looks aloft in contemplation, hear over again the song which the morning stars first sang together, or at this season, when he takes his solitary walk among the beautiful hills and lovely landscapes that surround us, he may not only feast his natural eye among the exquisite flowers which deck the rocks and festoon the cliffs, but his mental eye can enjoy a feast also of the most exquisite relish.

Light as well as sound has its gamut. The high notes comprise the violet end of the spectrum; the red end forms the base; and though the human ear may not catch the songs that the rose and the lily and the violet sing the livelong day, they may, for aught we know, be to the humming-bird, the butterfly, and the bee, music more enchanting than that which Prospero's Ariel sang to the shipwrecked mariners.

Surely the habit of observing nature as she is displayed in this beautiful world and its surroundings, whether in its flora or its fauna; in its organic or inorganic kingdoms; where all is order, harmony, and design, must be among the most pleasurable sources of intellectual enjoyment.

The perception of order in nature, without weariness of mind, is said to be the highest of intellectual pleasures. Aspire to it. Your training here has taught you to comprehend the invisible as well as the visible in nature; to picture with the eye of the mind operations, forces, and processes, which entirely elude the naked eye; to look at the very atoms of matter in motion and at rest; to follow them forth, without losing sight of them, into the world of the senses, and to see and to hear them there, expressing themselves in the phenomena of nature and with unutterable accord.*

Thus the harmonies of nature and the contemplation of the phenomena displayed by her is the true secret of those charms which

*Tyndall on sound.

sages find in solitude; and they are as much within the reach of the humblest among us as they are within the reach of the most powerful.

Therefore, take up, let me entreat you, for observation and study in your leisure moments, some one branch of the physical sciences. You will find it a never-failing source of pleasure and enjoyment.

Always keep in reserve points of inquiry relating to it upon which you desire information. The practice begets habits of inquiry, and fosters the observing faculties.

Now why, the thought may have arisen in the minds of some, do I lay such stress upon the development of intellectual faculties and the cultivation of love for physical science, and say so little about the practice of moral virtues and Christian graces?

Are you not heirs of THE LOST CAUSE, with its noble examples and Christian memories? Its traditions make us very proud. Are you not sons of the Sunny South? Do you not now, in the day of your youth, tread the soil of Virginia, breathe her atmosphere, and drink at the fountains from which the bravest of men and noblest of women have drawn inspiration? In them you have examples of the most heroic fortitude and of the gentlest graces that ever arrayed themselves on the side of right. They are trumpet-tongued. Their silent teachings are far more effective, with their mute eloquence, than my poor powers of speech can make them. Treasure them up. They are a precious legacy—heirlooms of inestimable value in the eyes of every true man among us!

ASSISTANT PROFESSORS.

COL. JOHN W. LYELL,
Assistant Professor of Mathematics.

CAPT. O. C. HENDERSON,
Assistant Professor of French Language.

CAPT. J. H. MORRISON,
Assistant Professor of Chemistry, Mineralogy, and Geology.

CAPT. ALFRED MARSHALL,
Assistant Professor of Mathematics and Tactics.

LIEUT. WM. M. PATTON,
Assistant Professor of Latin.

CAPT. PATRICK HENRY,
Assistant Professor of Languages.

LIEUT. R. H. COUSINS,
Assistant Professor of Mathematics.

CAPT. WM. B. PRITCHARD,
Assistant Professor of Geography, Tactics, and Drawing.

LIEUT. J. H. WADDELL,
Assistant Professor of Drawing, etc.

CAPT. W. H. BUTLER,
Assistant Professor of Mineralogy, Latin, and Tactics.

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Quartermaster and Treasurer.

COL. ROBERT L. MADISON, M. D.,
Surgeon.

HOWARD T. BARTON, M. D.,
Assistant Surgeon.

CAPT. JOHN T. GIBBS,
Commissary and Steward.

CAPT. C. A. ELLETT,
Adjutant.

SYSTEM OF INSTRUCTION AND GOVERNMENT

The System of Instruction and Government in the Virginia Military Institute is *distinctive* and is founded upon that of the United States Military Academy at West Point.

As soon as a young man enters the Institution, it assumes over him an entire control, and not only directs his moral and intellectual education, but provides everything required for his personal wants or comfort. A Cadet may, if his parents desire it, remain in charge of the Institution, for the entire term of four years, as the system of government keeps it always in operation. The months of July and August, in each year, are devoted exclusively to Military Exercises. Furloughs are granted to those who may desire it, in turn, during this period. The Cadets are lodged and boarded in the Institution, their *Clothing, Books,* and other supplies, being provided by the Quartermaster of the Institute *at cost.* The sick are under the special care of the *Surgeon,* with Hospital and other facilities for nursing.

The *energy, system, subordination, and self reliance* which the *military government* of the Institute cultivates, give a *practical* character to the education which it supplies. The high reputation which its Alumni have established for the School is the evidence of its value.

Attendance at Church and Bible instruction is prescribed for each Sabbath.

DEGREES.

A Diploma signed by the Governor of Virginia, and by the Visitors and Faculty, is awarded to all Cadets who may pass approved examinations on all the studies of the Academic School with the title of "*Graduate of the Virginia Military Institute.*" A like Diploma is awarded to all who may complete the course prescribed for either of the *Special Schools of Applied Science* with the title of "*Graduate*" in such school.

ESTIMATED EXPENSES FOR TWELVE MONTHS

Tuition.....	\$100 00
Board, \$15.00 PER MONTH.....	180 00
Washing, \$1.00 PER MONTH.....	24 00
Fuel and Lights, \$3.00 PER MONTH.....	36 00
Surgeon's Fee.....	10 00
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Estimated College Expenses for twelve months.....	\$350 00
Estimated Annual Cost for Clothing and Incidentals Supplied at the Ins...	150 00
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Total Expenses, including Clothing.....	\$500 00

This estimate is regarded as sufficient, but as Cadets differ much in the wear and tear of clothing, and in the care they take of it, the Institute does not bind itself that this estimate shall not be exceeded. It does bind itself to control, by all proper means, the expenses, and the average does not exceed the estimate.

When a Cadet leaves the Institute before the expiration of the year, *the Tuition fee and Surgeon's fee are required to be paid for the whole year.* A ratable deduction is made on all other charges. As the estimate includes clothing, the issues for the whole year are usually made within the first six months.

Deposits are made with the Treasurer semi-annually, in advance. The quarterly Circulars give a statement of the current expenses of each Cadet.

Pocket money is allowed, at the discretion of the parent, not exceeding \$5.00 per month for which a special deposit must be made with the Treasurer.

As the Cadets wear a prescribed *Uniform,* it is only necessary to bring a full supply of *under Clothing,* with Shoes, Towels, and Bedding, or these articles may be obtained at the Quartermaster's store at cost.

The Virginia Military Institute is prosecuting, under the general superintendence of *Com. M. F. Maury, LL. D., a Physical Survey of Virginia,* in which great State work, *Gen. G. W. C. Lee, Col. J. M. Brooke,* and *Col. M. McDonald,* will be associated with Commodore Maury. This work will afford an appropriate practical field of instruction for the Students of the School of Applied Science, and the Alumni of the Institute and the Board of Visitors earnestly ask the co-operation of the people of Virginia in this effort to prepare an accurate geographical map of Virginia, including its physical history.

For further information address the undersigned,

FRANCIS H. SMITH, Supt.